

IN THE CLAIMS

1. (currently amended) A method of removing a conductive material from a bevel edge of a conductive layer of a workpiece, including a front edge surface of the conductive layer, using an etching solution and an etching electrode in contact with the etching solution comprising the steps of:

holding a backside of the workpiece using a workpiece carrier;

rotating the workpiece;

directing a continuous stream of the etching solution to the bevel edge of the workpiece, including the front edge surface of the conductive layer, while rotating the workpiece; and

applying a potential difference between the electrode and the conductive layer of the workpiece while step of directing occurs.

2. (Cancel) ~~The method according to claim 1 wherein the step of directing directs a mild etching solution to the bevel edge.~~

3. (currently amended) The method according to claim ~~2~~ 1, wherein the ~~mild~~ etching solution etches the bevel edge more as a result of the applying of the potential difference than would occur without the application of the potential difference.

4. (currently amended) The method according to claim ~~2~~ 1, wherein the ~~mild~~ etching solution is a ~~plating~~ solution for plating and removal.

5. (currently amended) The method according to claim 4, further including the step of depositing a the conductive layer conductor on a top front surface of ~~the conductive layer~~ of the workpiece using the ~~plating~~ solution prior to the step of directing.

6. The method according to claim 5, wherein the step of depositing takes place with the workpiece disposed in a lower chamber of a vertical chamber assembly, and the steps of directing and applying take place with the workpiece disposed in an upper chamber of the

vertical chamber assembly, and further including the step of moving the workpiece from the lower chamber to the upper chamber after the step of depositing and before the step of directing.

7. The method according to claim 6 wherein the step of depositing uses an electrochemical mechanical deposition process.

8. The method according to claim 5 wherein the steps of depositing and directing both take place with the workpiece disposed in a single chamber.

9. The method according to claim 5 wherein the steps of depositing and directing both take place with the workpiece disposed in different respective chambers.

10. (currently amended) The method according to claim 4 1, further including the step of ~~depositing removing a conductive material from the conductive later~~ conductor on a front top surface of the ~~conductive layer~~ of the workpiece using a ~~plating~~ etching solution prior to the step of directing.

11. (currently amended) The method according to claim 10 wherein the step of ~~depositing removing~~ uses an electrochemical mechanical ~~deposition removal~~ process.

12. (currently amended) The method according to claim 10, wherein the step of ~~depositing removing~~ takes place with the workpiece disposed in a lower chamber of a vertical chamber assembly, and the steps of directing and applying take place with the workpiece disposed in an upper chamber of the vertical chamber assembly, and further including the step of moving the workpiece from the lower chamber to the upper chamber after the step of ~~depositing removing~~ and before the step of directing.

13. The method according to claim 10 wherein the step of depositing uses an electrochemical mechanical deposition process.

14. The method according to claim 4, further including the step of performing an electrochemical mechanical processing on a top surface of the conductive layer of the workpiece prior to the step of directing.

15. The method according to claim 14, wherein the step of performing electrochemical mechanical processing takes place with the workpiece disposed in a lower chamber of a vertical chamber assembly, and the steps of directing and applying take place with the workpiece disposed in an upper chamber of the vertical chamber assembly, and further including the step of moving the workpiece from the lower chamber to the upper chamber after the step of performing electrochemical mechanical processing and before the step of directing.

16. The method according to claim 14 wherein the steps of performing electrochemical mechanical processing and directing both take place with the workpiece disposed in a single chamber.

17. The method according to claim 14 wherein the steps of performing electrochemical mechanical processing and directing both take place with the workpiece disposed in different respective chambers.

18. (currently amended) The method according to claim ~~2~~ 1, further including the step of spraying a mist of the mild etching solution onto a top surface of the conductive layer.

19. The method according to claim 18 wherein the steps of spraying and directing both take place with the workpiece disposed in a single chamber.

20. The method according to claim 19 wherein the steps of spraying and directing both take place at the same time.

21. The method according to claim 19 wherein the steps of spraying and directing take place sequentially.

22. (currently amended) An apparatus for performing an edge bevel removal process on a front conductive surface edge of a conductive material on a workpiece comprising:

a chamber;

a moveable and rotatable workpiece holder that holds a backside of the workpiece and rotates the workpiece; and

~~an edge bevel removal system, the edge bevel removal system including:~~

at least one edge conductor material removal device for supplying a continuous stream of ~~an etching~~ solution toward at least the front conductive surface edge of the workpiece; and

~~an first electrode configured to be electrically coupled to adapted to physically contact the continuous stream of the solution; and for supplying a potential difference between the continuous stream and the front conductive surface of the workpiece~~

a second electrode configured to be electrically coupled to the conductive material; and

a power source configured to apply a potential difference between the first electrode and the second electrode.

23. (currently amended) The apparatus according to claim 22, wherein the at least one edge copper conductor material removal device comprises at least one nozzle disposed within a position relative to the workpiece such that a continuous stream of the ~~etching~~ solution is directed outwardly toward the front conductive surface edge of the workpiece.

24. (currently amended) The apparatus according to claim 22 further including at least a cleaning nozzle disposed within the chamber ~~for directing~~ configured to direct a mild second etching solution to a front surface of the workpiece.

25. (currently amended) The apparatus according to claim 24 wherein the ~~mild second etching~~ solution and the ~~etching~~ solution are the same ~~solution~~.

26. (currently amended) The apparatus according to claim 22 further including:
another chamber disposed below the chamber;

a moveable guard adapted to separate the another chamber from the chamber when the workpiece is in the chamber and the at least one edge ~~copper~~ conductor material removal device is being used; and

a system for processing a front surface of the workpiece disposed in the another chamber.

27. The apparatus according to claim 26 wherein the system is an electrochemical mechanical processing system.

28. The apparatus according to claim 27 wherein the electrochemical mechanical processing system is an electrochemical mechanical deposition system.

29. The apparatus according to claim 22 further including an electrochemical mechanical processing system disposed within the chamber for providing electrochemical mechanical processing on a front surface of the workpiece.

30. (currently amended) The apparatus according to claim 22, wherein;
the first electrode etching solution is configured to provide an electrical communication with the conductive material on the workpiece through the solution; and
the potential difference applied between the first electrode and the second electrode provides an electrochemical process of a conductive material on substantially an entire surface of the workpiece.

~~used by the at least one edge conductor material removal device is also used by the electrochemical mechanical processing system, and~~

~~—wherein the electrochemical mechanical processing system includes a cavity, an electrode disposed within the cavity, the etching solution disposed within the cavity to provide one electrical path from the electrode to the front surface of the workpiece, a workpiece surface influencing device disposed in proximity to workpiece and through which the etching solution flows and a terminal for providing electrical contact to the workpiece during electrochemical mechanical processing so that a potential difference between the etching solution disposed within the cavity and the workpiece can be maintained.~~

31. (currently amended) The apparatus according to claim 30 further comprising a cavity configured to enclose the first electrode, including a conduit for providing the continuous stream of the etching solution from the cavity to the at least one edge conductor material removal device.

32. (currently amended) The apparatus according to claim ~~32~~ 30, wherein the first electrode is immersed in the solution ~~31 further including another a terminal that provides electrical contact to the workpiece during edge conductor material removal.~~

33. (currently amended) The apparatus according to claim ~~32~~ 30, wherein the second electrode includes a plurality of terminals configured to physically contact the conductive material on the workpiece ~~another terminal is the same as the terminal.~~

34. (currently amended) The apparatus according to claim ~~32~~ 30, wherein the first electrode is used for both the electrochemical process and the edge bevel removal process ~~another terminal is different from the terminal.~~

35. (currently amended) The apparatus according to claim 30, wherein the edge ~~copper~~ conductor material removal device comprises at least one nozzle disposed in a position relative to the workpiece such that a continuous stream of the ~~etching~~ solution is directed outwardly toward the front conductive surface edge of the workpiece.

36. (currently amended) The apparatus according to claim 30 wherein the solution is for plating or removal and is configured to provide electrochemical mechanical processing ~~system is an electrochemical mechanical processing deposition system.~~

37. (currently amended) The apparatus according to claim 30 further including a fluid controller configured to adjust for controlling a level of the etching solution in the chamber to alter the electrical communication between the first electrode and the conductive material on the workpiece, wherein a first level is configured to provide an electrical connection to the first electrode via the continuous stream of the solution during the edge bevel removal and a second

level is configured to provide the electrical communication through the solution during the electrochemical process within the cavity, such that the etching solution has a first level when electrochemical mechanical processing takes place and another lower level within the cavity when edge bevel removal takes place.

38. (currently amended) A method of performing edge bevel removal on a workpiece and cleaning of a front face of a workpiece using a solution comprising the steps of:
holding a backside of the workpiece in a workpiece carrier;
rotating the workpiece;
directing a continuous stream of a ~~the solution obtained from a source~~ to a bevel edge of a conductive layer of the workpiece while rotating the workpiece to electrochemically remove conductive material from the bevel edge at a first rate; and
directing a spray of the solution ~~obtained from to the source~~ to a the front face of the ~~conductive layer of the workpiece~~ while rotating the workpiece to ~~clean~~ etch the front face of the workpiece at a second rate.

39. The method according to claim 38 wherein the steps of directing the stream and directing the spray are performed sequentially.

40. The method according to claim 38 wherein the steps of directing the stream and directing the spray are performed simultaneously.

41. (currently amended) The method according to claim 38 wherein while the step of directing the continuous stream occurs, a potential difference between the continuous stream of the solution and the conductive layer of the workpiece is applied, and wherein the spray is incapable of providing an electrical path to the conductive layer, thereby ensuring that any removal of the conductive material from the front face of the workpiece occurs at a the second rate that is less than the first rate.

42. (currently amended) The method according to claim 41 wherein the solution is a mild etching solution for plating or removal of material.

43. The method according to claim 41 wherein the steps of directing the stream and directing the spray are performed sequentially.

44. The method according to claim 41 wherein the steps of directing the stream and directing the spray are performed simultaneously.